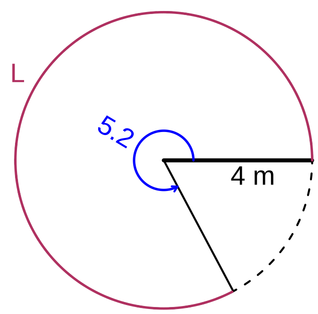
Name: Date:

Trig Final (Solution v25)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 5.2 radians. The radius is 4 meters. How long is the arc in meters?

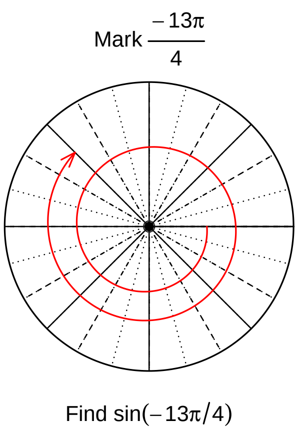


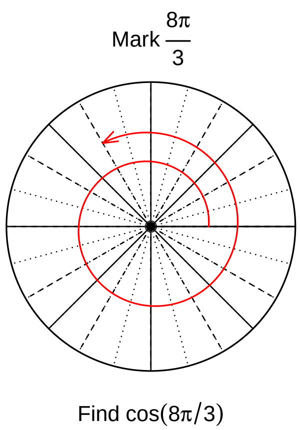
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 20.8$ meters.

Question 2

Consider angles $\frac{-13\pi}{4}$ and $\frac{8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-13\pi}{4}\right)$ and $\cos\left(\frac{8\pi}{3}\right)$ by using a unit circle (provided separately).





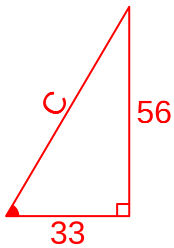
$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(8\pi/3) = \frac{-1}{2}$

Question 3

If $\tan(\theta) = \frac{56}{33}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

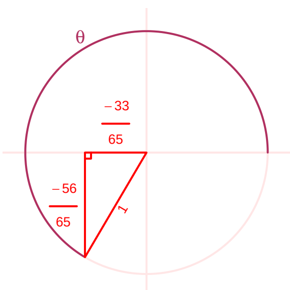
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$33^2 + 56^2 = C^2$$
$$C = \sqrt{33^2 + 56^2}$$
$$C = 65$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-33}{65}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -5.62$ meters, an amplitude of 8 meters, and a frequency of 2.13 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8\cos(2\pi 2.13t) - 5.62$$

or

$$y = 8\cos(4.26\pi t) - 5.62$$

or

$$y = 8\cos(13.38t) - 5.62$$